

west in the northern hemisphere and from north-west in the southern hemisphere prevail.

(3) These anti-trade winds do not extend beyond the polar limits of the trade winds; they are deviated to the right in the northern hemisphere and to the left in the southern, and become currents from the west above the tropical high pressure areas, where they descend to feed the trade winds.

(4) The air of the temperate zones is involved in vast "polar whirlpools," which rotate from west to east. This rotatory movement appears to be similar to that of ordinary cyclones; the air in the lower layers draws nearer to the centre of the whirl, while that in the upper layers recedes from it more and more as the height above the earth's surface increases up to the highest regions from which we have any observations.

(5) The layers of upper air of the temperate zones overflow the tropical high pressure areas, and there descend.

(6) The irregularities found at the surface of the earth, more particularly in the monsoon areas of India, disappear, as a general rule, at the level of the lower or intermediate clouds.

(7) The theory of a vertical circulation of the atmosphere between the tropics and the poles, which has hitherto been accepted (Ferrel, James Thomson), must be abandoned.

The report as published in the society's journal is very fully illustrated by reproductions of the diagrams of the original edition. M. Teisserenc de Bort's charts of the average distribution of pressure at the 4000-metre level for January and July are also given, and they illustrate in a very striking manner the scheme of general circulation of the upper air to which the results of Prof. Hildebrandsson's report point.

AMERICAN HYDROIDS.¹

THE first part of this large work dealt with the plumularian hydroids. After an interval of four years, the second part, a folio of some 150 pages and 57 plates, has been issued. It appeals exclusively and intentionally to the student of systematic zoology; but owing to the wide distribution of the family—the "sea-firs" of our coasts—this account, though dealing primarily with American species, will assist students of sertularian taxonomy in almost any part of the world.

The plan of this book is that of the first part. There is first an anatomical account of the stem and its branches, then a *résumé* of the distribution, horizontal and vertical, in different seas, and finally a hundred pages of specio-graphy. The most assiduous care has been employed in drawing up these descriptions and in illustrating them by well selected figures; and most critical and generous consideration is given to previous researches on this group of animals.

For some not very obvious reason, Prof. Nutting has decided to postpone the more interesting bearings of his subject to the final volume, and confines himself in the work before us rigidly to a consideration of the taxonomic and diagnostic features of the Sertulariidae. We look in vain for any explanation of the mode of distribution, though the occurrence of the majority in Alaskan and Arctic waters suggests a polar origin. There is no attempt to explain the absence of free medusæ, nor are we given any information as to the habits of these hydroids, their modes of growth and of repairing injury, the influence of light upon their branching and reproductive powers. There is not a single experiment recorded in the work, though it is to be expected from the plasticity of such coelenterates that continuous and discontinuous variation may be induced by changes in environment. On the other hand, differentiating anatomical characters, such as the forms of branching, the shape of the gonidial sacs, and the opercula, are described and combined into a system with great care, and it is to be hoped that Prof. Nutting has laid the foundation of a permanent and authoritative classification.

¹ "American Hydroids. Part ii. Sertulariidae." By C. C. Nutting, Smithsonian Institution. U.S. National Museum. Special Bulletin. (Washington, 1904.)

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—The Vice-Chancellor has been informed that at a meeting of medical graduates recently held in London to consider the present provision in the university for the department of pathology, it was resolved (1) that steps should be taken to bring before the university the necessity of permanent and adequate support being received for the pathological department; (2) that a fund be started for the purpose of assisting in this object, and the primary object of this be the establishment and endowment of a professorship in pathology.

It was announced last term that the Rhodes trustees have made a grant for five years to Dr. Ritchie, the present reader in pathology, and New College has now elected him to an ordinary fellowship for seven years, provided that he continues his readership and does research work. Mr. Edward Whitley, Trinity College, has very generously given the university a thousand pounds towards the permanent endowment of a pathology chair.

CAMBRIDGE.—The Vice-Chancellor announces two important bequests which have been left to the university. The first consists of 5000*l.*, to be expended in improving the instrumental equipment of the Newall Observatory, and of a very valuable collection of illuminated manuscripts and early printed books and objects of mediæval and early art, to be placed in the Fitzwilliam Museum, left by Mr. Frank McClean, F.R.S., of Trinity College. The second bequest is left by the late editor of the *Athenaeum*, Mr. Norman Maccoll, of Christ's and Downing Colleges, and consists of 500*l.* to form some endowment for a lectureship in Spanish or Portuguese, together with a valuable library of books.

The number of commissions allotted to the university, the first half-yearly nomination to which will take place after the examination in September next, is one in the Royal Artillery, one in the Indian Army, and five in the cavalry, Foot Guards, infantry, or the Army Service Corps.

The regulations for administering the Gordon Wigan fund are announced. The revenue will be divided between the special board of physics and chemistry and the special board of biology and geology, to be used in promoting and encouraging scientific education and research. The bequest amounts to some 900*l.*

LONDON.—Mr. William Loring, late director of education under the County Council of the West Riding of Yorkshire, has been appointed warden of the Goldsmiths' College, New Cross, and Mr. Edgar Schuster Francis Galton research fellow in national eugenics.

The Mercers' Company has voted a sum of 1000*l.* to the university for the promotion of the study of physiology at University College.

Mr. W. Williams has been awarded the degree of doctor of science through a thesis on "The Temperature Variations of the Electrical Resistances of Pure Metals," and other contributions.

Mr. H. M. Hobart has been appointed lecturer in electrical engineering design at the Northampton Institute in succession to Mr. E. K. Scott, who has been appointed lecturer in electrical engineering in the University of Sydney. Mr. M. H. Smith has been appointed chief assistant in the mechanical engineering department in succession to Mr. W. E. Curnock, who has been appointed head of the mechanical engineering department of the Technical College, Huddersfield.

MANCHESTER.—The new public health laboratories, which have been erected by the Victoria University and have cost 13,000*l.*, were opened on January 27 by Mr. W. J. Crossley. Lord Spencer, Chancellor of the University, presided at the ceremony, and the large gathering included the Lord Mayor of Manchester and the Mayor of Salford. Honorary degrees were afterwards conferred upon Prof. Calmelle, Lille University; Prof. Perroncito, Turin University; Prof. Salomonsen, Copenhagen University; and Captain R. F. Scott, R.N.

It has been resolved to institute, in the United College, University of St. Andrews, a lectureship in organic

chemistry, and to appoint Dr. James C. Irvine as the lecturer.

It is reported in *Science* that, by the will of the late Mr. E. W. Codman, of Boston and Nahant, Mass., an estate which may reach 200,000*l.* will be equally divided between Harvard University and the Massachusetts General Hospital.

THE United States ambassador, Mr. Choate, has accepted the invitation of the governing body of the Battersea Polytechnic to distribute the awards and deliver an address on the occasion of the next annual distribution of prizes on Wednesday evening, February 22.

It is reported in *Science* that Harvard University and the University of Berlin have practically arranged a method by which a temporary exchange of professors will occur. It is further stated that a similar arrangement has been made between the Massachusetts Institute of Technology and the Berlin Institute of Technology.

MR. J. D. ROCKEFELLER has signified his willingness to contribute to the University of Chicago for the year beginning July 1, 1905, the sum of 49,000*l.* for current expenses, this being the same sum that he has contributed during the present year. Mr. Rockefeller has also contributed this year 12,000*l.* for the enlargement of the heating plant of the university.

A COURSE of lectures and discussions has been arranged by the Childhood Society and the British Child-Study Association, to be delivered in the Parkes Museum, Margaret-street, W., and will commence on February 9. Among the subjects are:—Some physiological problems in education; the proposed anthropometric survey; mental faculty of the child: its growth and culture; fatigue in children; the health of children *qua* food and management; and imitation.

At the annual conference of representative Mahomedans from all parts of India, held at Lucknow a month ago, it was agreed to form science faculties at Aligarh College. The list of subscriptions towards this object was headed by the Raja of Mahmudabad with a munificent donation of Rs.35,000. The aggregate subscriptions to the fund for promoting the advancement of Aligarh College to the status of a university, which will be the future university of Mahomedans in India, now amounts to Rs.1,04,000 (7000*l.*).

IN connection with the fund instituted to supplement the resources of the Melbourne University, the Hon. F. S. Grimwade has given 100*l.* for the purpose of founding an annual prize at the university, to be awarded in respect of research work in some branch of industrial chemistry. This donation, says the *Pharmaceutical Journal*, raises the fund to 11,000*l.*, and enables the university to claim a subscription of 1000*l.* promised by Mr. Andrew Carnegie. The whole of the money subscribed, which, with a Government grant of 12,000*l.*, now totals 24,000*l.*, is to be devoted to the purpose of building laboratories. The Government has promised a supplementary grant of 5000*l.* next year.

THE need for a university in the south-west of England continues to be urged locally from time to time. At the recent ordinary general meeting of the governors of University College, Bristol, Mr. Henry Hobhouse said that it was unfortunate that the south-west of England was almost the only part of England and Wales that had no local university, and spoke of Bristol as the only possible centre for such an institution. Principal Lloyd Morgan, F.R.S., who returned recently from a visit to the United States, gave it as his opinion, after inspecting the equipment and work of the American university colleges, that when the amount of work done by the staff of Bristol University College is compared with the amount being done in any one of the American institutions he had visited, and the cost of the one is compared with the cost of the other, Bristol University College is ahead of them all. Several speakers urged the pressing need for more funds. In this connection we are glad to notice that the college received last year nearly 5000*l.* in donations outside the ordinary income.

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THE Association of Technical Institutions held its annual general meeting on January 27 at the Manchester School of Technology. Sir Philip Magnus was elected president of the association for 1905, and in the course of his address directed attention to the fact that in technical institutions the students who attend even the most elementary technological classes are too often insufficiently prepared to profit by the teaching. They are deficient in power of expression; they lack practical knowledge of arithmetic and the rudiments of science and the necessary skill in drawing. In a word, the training in the elementary schools of the country has not produced satisfactory results. The elementary teaching must be made more practical. The workroom will supersede the class room in elementary schools, continued Sir Philip Magnus, and manual training will become the central feature of the training around which other studies will be grouped. Numerous papers were read. Principal Reynolds, of Manchester, Mr. Wilkinson, of Bolton, and Principal Crowther, of Halifax, read papers on the co-ordination of the work of evening continuation schools and municipal technical institutions. The co-operation of employers in the technical training of their apprentices was the subject of a discussion opened by Principal Belcher, of Coventry, and Principal Gannon, of Norwich. The registration of teachers in technical institutions was dealt with by Principal Wells, of Battersea.

THE report of the council of the Association of Technical Institutions was presented at the annual general meeting on January 27. The report states that, from the point of view of those specially concerned with technical education, the year 1904 has been marked chiefly by the development and co-ordination of local educational organisation and by the perfecting of matters of internal administration. It is too soon, the report states, to say what the effects of the abolition of the Technical Instruction and Local Taxation (Customs and Excise) Acts and the placing of all branches of education under one local authority may have upon the further extension of technical education. While recognising the possible danger to these interests of the large and growing demand for expenditure upon other branches of education, the association views with satisfaction the increasing recognition of the belief that technical education can only produce the best results when it builds upon the sure foundation of a sound secondary education. Among matters to which the association has given attention may be mentioned that of the possibility of obtaining a number of research scholarships, tenable by advanced students in technical institutions; and that of the desirability of instituting a scheme for the issue by technical institutions of diplomas upon some common basis of award. This last question is of such importance that it has been referred to a subcommittee for further inquiry and report.

THE annual meeting of the Mathematical Association was held at King's College on January 28. Prof. G. B. Mathews, F.R.S., was elected president for the ensuing year. Papers were read on models and their uses by Mr. E. M. Langley, and on the new geometry by Mr. W. H. Wagstaff, who does not think it is desirable to make all boys learn deductive geometry, but that some should learn logic instead, and that some training in practical geometry should be given to all. A discussion on the question: "Should Greek be Compulsory for Mathematicians at Cambridge?" was opened by Mr. A. W. Siddons, who urged that mathematicians should not have special arrangements made for them; that, if Greek was compulsory for others, it should be for mathematicians also. Prof. A. R. Forsyth, F.R.S., said it is to his mind extraordinary that teachers of classics argue that, if Greek be made optional, therefore the subject will become extinct. The subject has a strong hold on the public schools and the universities; every outside inducement to its continuation is still maintained, but in a large number of schools in the country Greek is now extinct. If the ancient universities maintain this barrier of Greek as a preliminary qualification for a degree, it means one of two things—either that all the boys in those schools where Greek is now extinct are cut off from the universities, and so those institutions cease to be contributing to the educational

wealth of the country to the same extent as they used to do, or else that many boys often proceed to get up the subject from the point of view of satisfying a miserable minimum. What was asked for is a relaxation in favour of education in general and not in favour of any special class of people. The elimination of literary training in the country is not being sought.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, November 24, 1904.—“Preliminary Communication on Galvanic Cells produced by the Action of Light.” By Dr. M. **Wilderman**. (From the Davy-Faraday Laboratory of the Royal Institution.)

The author finds that there is, under the action of light, a region of galvanic cells as wide and as varied as in the case of ordinary galvanic cells. He finds constant and inconstant cells, reversible and irreversible cells. The chemical reactions and chemical equilibrium in the galvanic combinations are now perfectly clear; they prove, however, to be all *sui generis*, all the phenomena being intermixed and characterised by phenomena of induction and deduction, peculiar to light cells only. The author also succeeded in placing this region of phenomena on a physico-mathematical basis, testing and proving the fundamental equations experimentally in all details. The principal results obtained are:—

(1) The total E.M.F. created by light consists of an E.M.F. produced by light at a constant temperature, owing to the increase of the chemical potential and of the solution pressure of the exposed plate, and of a thermo-E.M.F. caused by one of the plates in contact with the liquid being heated by light. Both E.M.F.'s are found to be directly proportional to the intensity of light; both give currents in the same direction, thus proving that light acts on the chemical potential as well as on the solution pressure of the electrode in the same way as does heat.

(2) The peculiar course of the induction and deduction periods enables one to distinguish constant and inconstant cells showing polarisation from one another. A consideration of the chemical composition and of the reactions going on in the systems under the action of the current leads to the same results.

(3) The induction period follows a law

$$d\pi/d\tau = c(\pi_0' - \pi)(\pi - \pi_0 + K),$$

giving at the same time also the fundamental law of photography relating to the connection between the amount of silver salts decomposed and the time of exposure. The deduction period follows a similar law

$$-d\pi/d\tau = -c'(\pi_0 - \pi)(\pi - \pi_0' + K').$$

(4) The fundamental equation for the E.M.F. of constant cells “reversible in respect of cation” (e.g. Ag plate in light, AgNO₃ solution in light, AgNO₃ solution in the dark, Ag plate in the dark) is

$$\Sigma E = 0.860T (\log_e P_1/P_a - 2v/u + v \log_e p_1/p_a) 10^{-4} \text{ volt},$$

and for constant cells “reversible in respect of the anion” (e.g. Ag-BrAg plate in light, KBr solution in light, KBr solution in the dark, Ag-BrAg plate in the dark) is

$$\Sigma E = 0.860T (-\log_e P_1/P_a + 2u/u + v \log_e p_1/p_a) 10^{-4} \text{ vol},$$

where P_1 , P_a are the solution pressures of the electrodes in light and in dark, p_1 , p_a are the osmotic pressures of the cation or anion in the solution in light and in dark, and T is the absolute temperature.

The theory of thermogalvanic cells is also given in the paper.

December 8, 1904.—“The Rôle of Diffusion during Catalysis by Colloidal Metals and Similar Substances.” By Dr. Henry J. S. **Sand**. Communicated by Prof. J. H. Poynting, F.R.S.

This paper contains a criticism of the opinion expressed by Nernst (*Zeitschrift Phys. Chem.*, xlvii., 55) that the catalytic decomposition of hydrogen peroxide due to

colloidal metals probably takes place practically instantaneously on the surface of the catalyser, so that the concentration of the hydrogen peroxide there is permanently maintained at zero, and the velocity of the reaction actually measured is that with which diffusion and convection renew the solute in contact with the catalytic particles.

As a result, it was shown that Nernst's hypothesis would lead us to expect the reaction to proceed as one of the first order, a conclusion which agrees with the experimental results found by Bredig and his pupils. The actual values of the experimental velocity-constants are, however, far too small to allow us to reconcile them with Nernst's suggestion, and the latter must therefore be rejected.

In order to arrive at this result, minimum theoretical values for the rate of the reaction were calculated on Nernst's hypothesis. For this purpose the particles were assumed to be spheres with a diameter of 0.5μ , a value which, according to Bredig, is greater than any which was met with in his solutions. The particles were supposed to be in a state of continual movement, performing the so-called Brownian motions, but in travelling through the solution were assumed to take with them a film of adhering liquid. In order to obtain a minimum value for the reaction velocity the total volume of the films was supposed to be equal to that of the whole liquid. The diffusion-coefficient of hydrogen peroxide at 25° was taken as 10^{-5} cm.²/sec., a value which is smaller than that of most substances with heavier molecules.

The great part played by convection due to the Brownian motions of the particles and stirring by gases, &c., was demonstrated, it being pointed out that the experimental results regarding the dependence of the velocity-constants on the concentration of the catalyser can only be reconciled with the idea of a heterogeneous reaction if convection plays an important part.

Lastly, it was shown that the experimental facts all agree with the assumption that the actual velocity of the reaction on the surfaces of the particles always has a finite value which is proportional to the concentration of the solute in immediate contact with them.

In conclusion, Nernst's views regarding reaction-velocities in heterogeneous systems were criticised from a thermodynamical point of view, and it was shown that whereas they may possibly be correct for the majority of physical processes, great caution should be exercised in applying them to processes of a chemical nature.

January 19.—“The Dual Force of the Dividing Cell. Part i.—The Achromatic Spindle-Figure, elucidated by Magnetic Chains of Force.” By Prof. Marcus **Hartog**. Communicated by Sir William T. Thiselton-Dyer, K.C.M.G., C.I.E., F.R.S.

The essential points of this research are described as:—(1) The introduction of a convenient apparatus for the study of the axial section of fields produced by isolated poles of a dual force.

(2) The formation of *chains of force* in a viscid material, the recognition of their character as a distinct type of material configuration, and the study of their properties.

(3) The application of the conception of *relative permeability*, and of the recognition of chains of force to the problem of the cell-figure.

Zoological Society, January 17.—Mr. G. A. Boulenger, F.R.S., vice-president, in the chair.—(1) Some notes on the cranial osteology of the mastigure (*Uromastix*); (2) a contribution to the anatomy of *Chlamydosaurus* and some other Agamidæ; and (3) a note on the brain of *Cynopithecus niger*: F. E. **Beddard**, F.R.S.—(1) A collection of sipunculids made at Singapore and Malacca; (2) a collection of geophyrean worms from Zanzibar; and (3) the sipunculids and echiurids collected during the “Skeat Expedition” to the Malay Peninsula: W. F. **Lanchester**. Four new species were described in the second paper and nine in the last.—On the oral and pharyngeal denticles of elasmobranchs: A. D. **Imms**. The author had found that these denticles were present in varied abundance over the mucous membrane lining both the oral and pharyngeal cavities in many of these fishes. Out of the specimens of the nineteen species